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கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2022(2023)
General Certificate of Education (Adv. Level) Examination, 2022(2023)

ජීව විද්‍යාව I
உயிரியல் I
Biology I

09 E I

පැය දෙකයි
இரண்டு மணித்தியாலம்
Two hours

Instructions:

- *Answer **all** questions.*
- *Write your **Index Number** in the space provided in the answer sheet.*
- *Instructions are given on the back of the answer sheet. Follow them carefully.*
- *In each of the questions from **1** to **50**, pick one of the alternatives from (1), (2), (3), (4), (5) which **is correct** or **most appropriate** and **mark your response on the answer sheet with a cross** (×) on the number of the correct option in accordance with the instructions given on the back of the answer sheet.*

1. Which of the following statements regarding lipids is correct?
(1) Lipids are macromolecules consisting of C, H and O.
(2) Each hydrocarbon chain of saturated fats contains one double bond.
(3) When fats are formed, glycerol and fatty acids are joined by hydrogen bonds.
(4) H:O ratio in lipids is higher than 2:1.
(5) Two phosphate groups are present in a phospholipid molecule.

2. In a compound light microscope,
(1) lenses reflect light to magnify the image of the specimen observed.
(2) resolution power is inversely proportional to the wavelength of light.
(3) the image produced by the eye piece lens is magnified by the objective lens.
(4) the maximum magnification is usually 600 times of the actual size of the specimen.
(5) resolution power is 0.2 mm.

3. A function common to both rough endoplasmic reticulum and smooth endoplasmic reticulum is
(1) synthesis of glycoproteins.
(2) synthesis of phospholipids.
(3) metabolism of carbohydrates.
(4) production of transport vesicles.
(5) storage of calcium ions.

4. Which of the following statements regarding subcellular components of an eukaryotic cell is correct?
(1) DNA and ribosomes are present in thylakoids.
(2) Outer membrane of a mitochondrium contains stalk particles.
(3) Glyoxysomes have enzymes required to convert fatty acids to glycolipids.
(4) Golgi apparatus manufactures cellulose.
(5) Chromatin is embedded in nuclear lamina, which is made up of protein.

5. Which of the following statements regarding enzymes is correct?
(1) Activators affect the function of enzymes by binding to active sites through covalent bonds.
(2) Shape of the active sites of enzymes changes due to temperatures higher than the optimum level.
(3) Many competitive inhibitors bind to active sites of enzymes irreversibly and change their shape.
(4) Toxins bind to enzymes reversibly through covalent bonds.
(5) Co-enzymes are proteinous components which are permanently or temporarily bound to enzymes.

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6. The electron transport chain
   (1) is located in the matrix of mitochondria.
   (2) generates two molecules of ATP on average due to oxidation of one NADH molecule.
   (3) uses molecular oxygen as the first electron acceptor.
   (4) generates one molecule of ATP on average due to oxidation of one $FADH_2$ molecule.
   (5) is composed of protein and non-protein molecules.

7. Four events of aerobic respiration of a glucose molecule are as follows:
   A - Release of two CO_2 molecules by decarboxylation
   B - Oxidation of NADH and $FADH_2$
   C - Oxidative phosphorylation
   D - Substrate level phosphorylation
   The correct sequence of occurrence of above events is
   (1) A, C, B and D. (2) A, D, B and C. (3) B, C, A and D.
   (4) B, D, A and C. (5) B, D, C and A.

8. The three eras of the Phanerozoic eon (A–C) and five events that took place in those eras (P–T) are given below. Select the answer that indicates the correct 'era-event' combinations.

Era	Event
A – Palaeozoic	P – Origin of mammals
B – Mesozoic	Q – Origin of reptiles
C – Cenozoic	R – Dominance of gymnosperms
	S – Dominance of amphibians
	T – Radiation of birds

   (1) A–S, B–R, C–T, A–Q, B–P
   (2) A–Q, B–P, C–R, B–S, B–T
   (3) A–S, B–R, C–Q, B–T, C–P
   (4) A–Q, B–S, C–P, A–R, B–T
   (5) A–S, B–R, C–T, B–Q, C–P

9. Which of the following is considered as an artificial group in the classification of organisms?
   (1) Bacteria (2) Protista (3) Fungi (4) Arthropoda (5) Plantae

10. Select the pair which is most likely to have the highest number of common characteristics.
   (1) Bacteria and Archebacteria
   (2) Annelida and Nematoda
   (3) Bats and whales
   (4) Birds and reptiles
   (5) Lycophyta and Pterophyta

11. Which of the following statements regarding seedless vascular plants is/are correct?
   A - All club mosses are homosporous.
   B - Some pterophytes are homosporous.
   C - Some lycophytes are heterosporous.
   (1) A only. (2) A and B only. (3) A and C only.
   (4) B and C only. (5) A, B and C

12. Which of the following features is present only in one class of the phylum Chordata?
   (1) Ectothermy (2) Teeth
   (3) Four-chambered heart (4) Colour vision
   (5) Cycloid scales

[See page three

13. Meristematic cells
(1) contribute to both primary growth and secondary growth.
(2) undergo both mitotic and meiotic divisions.
(3) may be either spherical or elongated.
(4) are present only in root tips and shoot tips.
(5) contain a nucleus shifted to a side due to the presence of a large central vacuole.

14. Which of the following contribute to opening of stomata?
A - Increase in turgor in guard cells
B - Production of Abscisic acid
C - Flow of water from guard cells into substomatal cavity
D - Accumulation of K^+ in guard cells
(1) A and B only. (2) A and C only. (3) A and D only.
(4) B and C only. (5) B and D only.

15. Passive movement of water and hydrophilic solutes across membranes with the help of transport proteins is called
(1) diffusion. (2) osmosis. (3) imbibition.
(4) facilitated diffusion. (5) bulk flow.

16. Nitrogen (N) and boron (B) can be absorbed into plants respectively as,
(1) NO_3^- and $H_2BO_3^-$. (2) NH_4^+ and HBO_3^{2-}. (3) NO_2^- and $H_2BO_3^-$.
(4) NO_3^- and BO_3^{3-}. (5) NO_2^- and HBO_3^{2-}.

17. Which of the following structures of an angiosperm is diploid?
(1) Megaspore (2) Microspore (3) Ovule
(4) Pollen grain (5) Embryo sac

18. Plant hormones that regulate cell division, promote leaf senescence and enhance apical dominance are respectively
(1) gibberellins, ethylene and cytokinins.
(2) gibberellins, abscisic acid and cytokinins.
(3) auxin, ethylene and cytokinins.
(4) cytokinins, ethylene and auxin.
(5) cytokinins, abscisic acid and auxin.

19. Select the correct answer based on the following two statements.
A - A function of connective tissues is providing support.
B - Reticular fibres provide strength to connective tissues.
(1) Both **A** and **B** are correct and **B** contributes to **A**.
(2) Both **A** and **B** are correct and **B** does not contribute to **A**.
(3) **A** is correct and **B** is incorrect.
(4) **A** is incorrect and **B** is correct.
(5) Both **A** and **B** are incorrect.

20. In man, synthesis of vitamin B, recovery of ions and fermentation of undigested material take place respectively in
(1) rectum, duodenum and cecum.
(2) small intestine, colon and rectum.
(3) colon, stomach and small intestine.
(4) small intestine, gall bladder and large intestine.
(5) colon, small intestine and cecum.

21. Anti-B antibodies are present in the blood plasma of persons having which of the following blood groups?
(1) A and B (2) A and O (3) A and AB (4) A, B and O (5) A, AB and O

[See page four

22. Which of the following statements regarding the lymphatic system of man is correct?
(1) Lymph vessels differ from arteries due to absence of valves.
(2) Lymph drains into the arteries at the base of the neck *via* two large ducts.
(3) Composition of lymph is the same as blood plasma.
(4) Lymphatic system is involved in the absorption of vitamin C in the small intestine.
(5) Lymph nodes are mainly composed of connective tissues and white blood cells.

23. Select the correct statement regarding antibodies.
(1) They have several epitopes for binding with specific antigens.
(2) They have the same Y-shaped structure as T lymphocyte antigen receptors.
(3) They can be transferred to another person to induce immunological memory.
(4) They can directly destroy specific pathogens in blood.
(5) They bind with specific antigens to activate the complement system.

24. In the human brain, cardiovascular centre is located in the
(1) hypothalamus. (2) mid brain. (3) pons Varolii.
(4) medulla oblongata. (5) cerebellum.

25. Some actions of the autonomic nervous system of man are given below.
A - Inhibits salivary gland secretion
B - Stimulates activity of pancreas
C - Promotes emptying of urinary bladder
Which of the above actions is/are carried out by the parasympathetic division?
(1) **A** only. (2) **A** and **B** only. (3) **A** and **C** only.
(4) **B** and **C** only. (5) **A**, **B** and **C**

26. Select the correct statement regarding sensory receptors of man.
(1) Receptors for taste are modified neurons.
(2) Olfactory receptors show sensory adaptation.
(3) Ruffini corpuscles detect cold.
(4) Cones are more sensitive to light than rods.
(5) Hair cells of the vestibule of the ear detect angular movements.

27. The hormone secreted by anterior pituitary which has non-tropic effects is
(1) oxytocin. (2) ACTH. (3) prolactin. (4) FSH. (5) ADH.

28. Mature sperms in man are stored until ejaculation in the
(1) seminiferous tubules. (2) epididymis.
(3) seminal vesicles. (4) prostate glands.
(5) bulbourethral glands.

29. Select the correct statement regarding the reproductive system of human females.
(1) Medulla of the ovary contains ovarian follicles.
(2) Oogenesis starts at puberty.
(3) Secondary oocyte arrested at metaphase I is released at ovulation.
(4) Secretory phase of the uterine cycle is coordinated with the luteal phase of the ovarian cycle.
(5) Implantation of embryo occurs at morula stage.

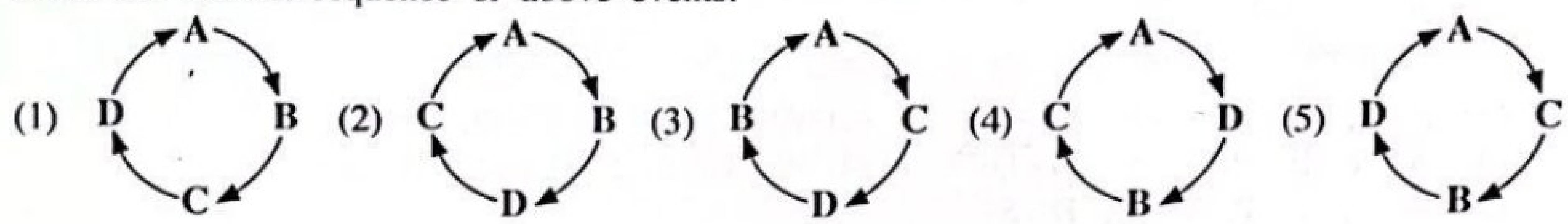
30. Select the correct statement regarding breast milk.
(1) Oxytocin stimulates synthesis of milk in mammary glands.
(2) Elevated estradiol level in mother's blood at birth stimulates release of milk.
(3) Colostrum contains more lactose compared to true breast milk.
(4) White blood cells in breast milk provide some immunity to infants.
(5) Sodium content is high in breast milk.

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31. Events that occur during the cross bridge cycle of skeletal muscle cell contraction are given below.

- **A** - Myosin head binds to actin forming cross bridges.
- **B** - Myosin head enters into a higher energy state.
- **C** - Sliding of thin filaments releasing ADP and phosphate from myosin.
- **D** - Binding of a new ATP molecule to myosin head detaching actin.

Select the correct sequence of above events.



32. In sex linked inheritance of humans,

(1) most of the X-linked recessive disorders are expressed in the heterozygous genotype of females.
(2) most of the X-linked recessive disorders are expressed in males.
(3) mothers transfer X-linked characters only to their daughters.
(4) fathers transfer X-linked characters only to their sons.
(5) males express only X-linked dominant disorders.

33. If F_2 generation of a monohybrid cross shows 1:2:1 ratio for both the phenotypes and genotypes, the type of inheritance

(1) is incomplete dominance but not codominance.
(2) is codominance but not incomplete dominance.
(3) is either incomplete dominance or codominance.
(4) is neither incomplete dominance nor codominance.
(5) cannot be determined as the information given is insufficient.

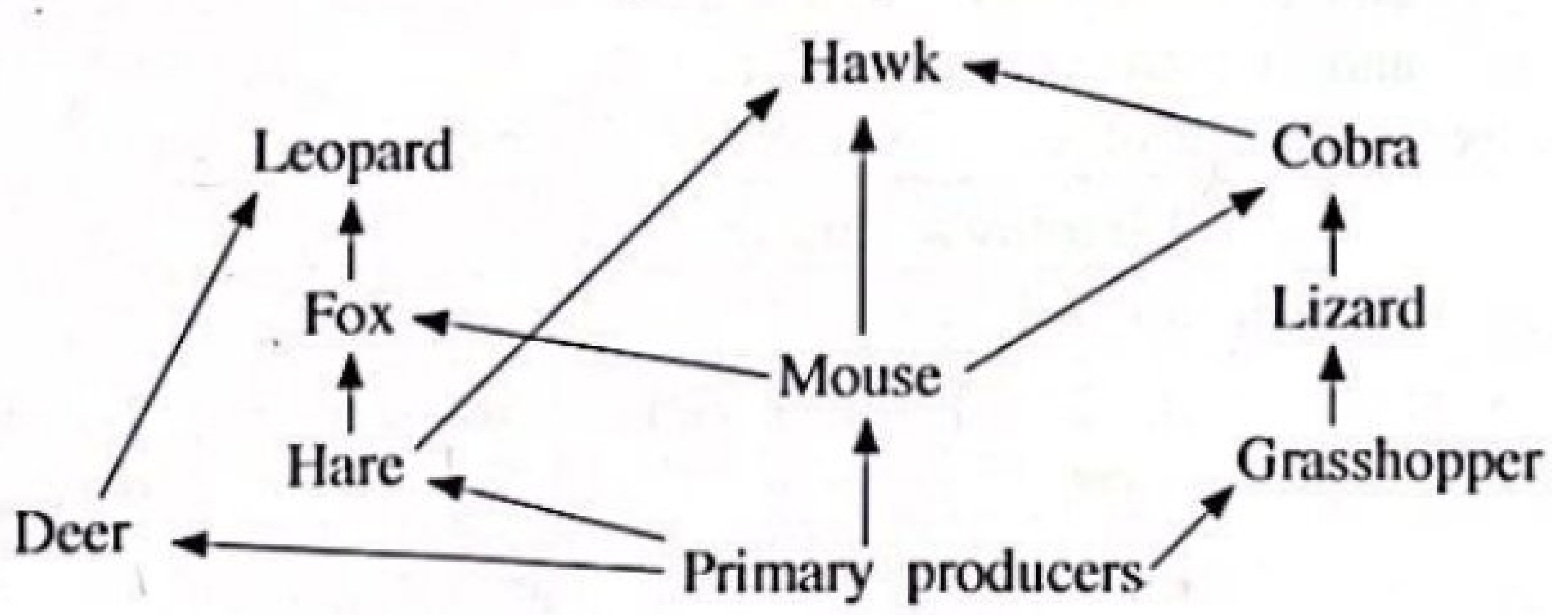
34. A point mutation

(1) ensures variation.
(2) may lead to carcinogenesis.
(3) may often be lethal.
(4) never leads to change the function of a protein.
(5) may lead to aneuploidy.

35. Select the answer that contains only the products of recombinant DNA technology.

(1) Insect pest tolerant maize, rice with increased provitamin A, tissue cultured banana
(2) Papaya resistant to papaya ring spot virus, Texel sheep, soybean with increased oleic acid content
(3) Hepatitis B vaccine, non-browning apple, triploid water melon
(4) Seedless grapes, drought resistant soybean, chymosin for making cheese
(5) 'RoundUP Ready' soybean, human insulin, tomatoes with delayed fruit ripening

36. The food web of a terrestrial ecosystem is given below.



The number of secondary and tertiary consumers in the above ecosystem are respectively

(1) five and two.
(2) three and five.
(3) four and three.
(4) four and four.
(5) five and three.

[See page six

37. Four organisms seen in Sri Lanka (A–D) and four features which are important when biodiversity is considered (P–S) are given below. Select the answer that gives the correct combinations.

Organism	**Feature important in biodiversity**
A – Guinea grass	P – Endemic
B – Black ruby barb	Q – Exotic
C – Snakehead	R – Invasive
D – Rubber	S – Indigenous

(1) A–P, B–S, C–S, D–Q (2) A–R, B–P, C–Q, D–S
(3) A–R, B–P, C–S, D–Q (4) A–R, B–S, C–P, D–Q
(5) A–S, B–P, C–R, D–S

38. Asexual reproduction by simple cell division/fission is seen in
(1) filamentous fungi and colonial filamentous cyanobacteria.
(2) unicellular protists and filamentous fungi.
(3) colonial filamentous cyanobacteria and unicellular fungi.
(4) bacteria and colonial unicellular cyanobacteria.
(5) colonial nonfilamentous cyanobacteria and bacteria.

39. *Escherichia coli*
(1) is an obligatory anaerobic microorganism.
(2) synthesizes vitamin E in the large intestine of man.
(3) is the first organism to enter the intestine of a new born baby.
(4) is an opportunistic pathogen that can infect lungs.
(5) is ingested as probiotics during antibiotic therapy.

40. Some plants used in the floriculture industry and their vegetative propagation methods are given below.
(A) *Hibiscus* - Layering
(B) Snake plant - Using leaf cuttings
(C) Spider plant - Grafting
(D) Begonia - Separation

Which of the above combinations is correct?
(1) (A) and (B) only. (2) (A) and (D) only. (3) (B) and (C) only.
(4) (B) and (D) only. (5) (C) and (D) only.

- **For each of the questions 41 to 50, one or more of the responses is/are correct. Decide which response/responses is/are correct and then select the correct number.**

If only (A), (B) and (D) are correct .... (1)
If only (A), (C) and (D) are correct .... (2)
If only (A) and (B) are correct .... (3)
If only (C) and (D) are correct .... (4)
If any other response or combination of responses is correct .... (5)

Directions summarised				
(1)	(2)	(3)	(4)	(5)
(A), (B), (D) correct.	(A), (C), (D) correct.	(A), (B) correct.	(C), (D) correct.	Any other response or combination of responses correct.

41. Select the response/responses which indicates/indicate examples for five adjacent hierarchial levels of biological organization.
(A) Cellulose, tracheid, xylem, root, plant
(B) DNA, nucleus, neuron, brain, nervous system
(C) Nervous system, deer, herd of deer, wild animals, dry mixed evergreen forest
(D) ATP, mitochondria, eosinophil, blood, heart
(E) RuBP, chloroplast, mesophyll cell, leaf, plant

[See page seven

42. Which of the following statements regarding tracheids is/are correct?
(A) They are found in club mosses and hornworts.
(B) They are long broad cells with tapering ends.
(C) Their secondary walls are thickened with lignin.
(D) They are involved in conducting water.
(E) Mitochondria present in the cytoplasm of mature tracheids provide energy for their functioning.

43. Select the correct statement/statements regarding clotting of blood in man.
(A) Fibrinogen is converted to fibrin by thrombin.
(B) Prothrombrin present in platelets is converted to thrombin.
(C) Heparin prevents conversion of prothrombin to thrombin.
(D) Vitamin K is a clotting factor present in blood plasma.
(E) Platelets become sticky due to agglutinogen present on their surface.

44. Which of the following combinations is/are correct regarding the main nitrogenous excretory product of the given animal group?

	Animal group	**Main nitrogenous excretory product**
(A)	Birds	Uric acid
(B)	Bony fishes	Ammonia
(C)	Adult amphibians	Ammonia
(D)	Sharks	Urea
(E)	Land snails	Urea

45. In the human skeleton,
(A) frontal bone contributes to form the cranium and face.
(B) twelve pairs of ribs form the lateral walls of the thoracic cage.
(C) lumbar curvature of the vertebral column develops at about three months after birth.
(D) special joint between the first metacarpal and a carpal bone permits precision grip of man.
(E) arches of the foot are important in distributing the body weight evenly over the foot only when stationary.

46. Core of supercoiled prokaryotic chromosome
(A) binds the loops of compacted DNA.
(B) attaches the chromosome to the membrane.
(C) facilitates relaxing of entire chromosome during replication.
(D) allows domains to relax independently during transcription.
(E) guides RNA polymerase to the site of initiation of transcription.

47. Which of the following responses indicates/indicate in correct order, the plants that are found in three ecosystems located in increasing altitudes of Sri Lanka?
(A) *Salicornia* sp., Heerassa, *Themeda*
(B) Kadol, Weera, Hora
(C) Katu ikili, Gal weralu, Ranawara
(D) Palu, Hal, Tussock grass
(E) Karan koku, Naa, Gini andara

48. Which of the following statements regarding the use of microorganisms in industries is/are correct?
(A) Invertase is produced using *Saccharomyces cerevisiae*.
(B) *Thiobacillus ferrooxidans* is used in the extraction of copper from lower grade ores containing sulphur and iron.
(C) Riboflavin is produced through metabolic activity of *Acetobacter* sp.
(D) Human growth hormone is produced using genetically engineered *Escherichia coli*.
(E) Citric acid is produced using *Gluconobacter* sp.

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49. Which of the following bacterial species causes/cause both water borne and food borne diseases?
   (A) *Salmonella* sp.
   (B) *Staphylococcus* sp.
   (C) *Vibrio* sp.
   (D) *Shigella* sp.
   (E) *Clostridium* sp.

50. Which of the following should be carried out monthly when maintaining an aquarium?
   (A) Cleaning of air diffuse stones
   (B) Pruning of aquarium plants
   (C) Scraping algae grown on glass surface
   (D) Removing organic debris accumulated under filter plates
   (E) Removing diseased fish

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ජීව විද්‍යාව II
உயிரியல் II
Biology II

09 E II

Part B - Essay

Instructions:

※ *Answer* ***four*** *questions only.*
Give clear labelled diagrams where necessary.
(Each question carries **150** *marks.)*

5. Describe the nuclear division where the chromosome number is reduced during meiosis.

6. Briefly describe the process of secondary growth in a dicot stem.

7. (a) Explain how Domain Bacteria differs from Domain Eukarya.

(b) Describe the vaccines used in controlling microbial diseases.

8. (a) Draw a fully labelled diagram of the functional unit of the human kidney with associated blood vessels.

(b) Describe the process of formation of urine in man.

9. (a) Describe the basic structure of the human sperm and state the functions of each of its parts.

(b) Explain the hormonal regulation of spermatogenesis in man.

10. Write short notes on the following.

(a) Disadvantages of artificial breeding of plants

(b) Okazaki fragments and their synthesis

(c) Desert plants

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